Group beating resulting from ventricular parasystole

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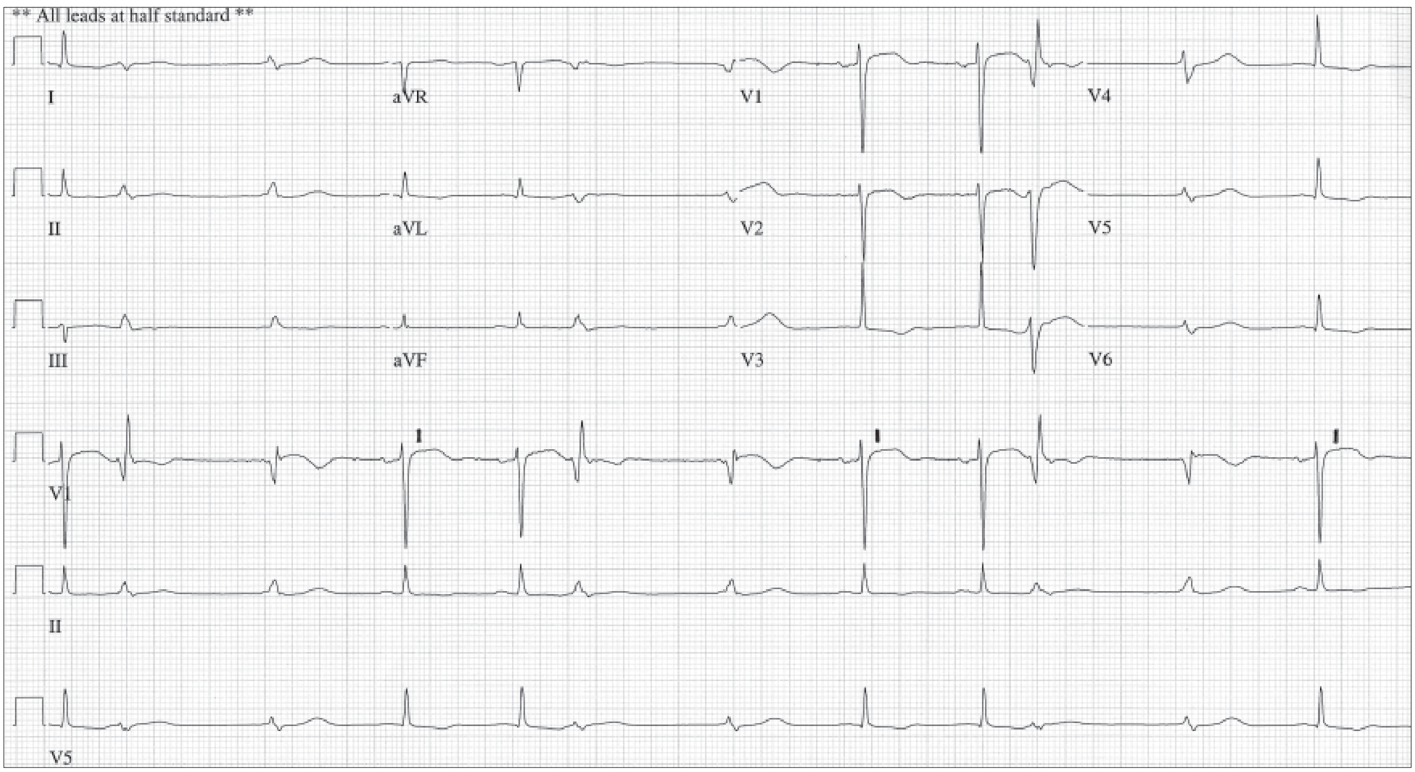

Figure. Electrocardiogram in a 90-year-old man shows a repetitive pattern, or group beating. See text for explication.

This electrocardiogram of a 90-year-old man shows repeating similar cycles, each consisting of 4 complexes *(Figure)*. Every cycle begins with 2 sinus-initiated complexes followed by an early, wide QRS (ventricular premature complex) that has a right-bundle-branch-block configuration and precedes a pause that is terminated by a slightly different, wide QRS. The cycle then repeats itself. What is not readily apparent is that the interval between each ventricular premature complex and the following wide QRS (1.10 seconds) is exactly half the interval between this second wide QRS of each cycle and the ventricular premature complex of the next cycle (2.20 seconds). Furthermore, an interval of 1.10 seconds from the beginning of the last QRS of each cycle lies in the ventricular refractory period of the first sinus-initiated complex of the next cycle (vertical lines above the V_1 rhythm strip). Thus, one can make a good case for a left ventricular, parasystolic focus discharging every 1.10 seconds, with every third impulse failing to capture the ventricles because it arrives in the absolute refractory period.

Why is the second wide QRS complex of each cycle different from the first wide QRS? Close inspection again is the key and reveals that immediately following each premature wide QRS complex, there is a retrograde P wave that resets the sinus node and causes the ensuing P′-P interval to be longer than the usual P-P interval. Before the next sinus P wave can be conducted to the ventricles, the atrioventricular junction escapes, causing a fusion beat with the simultaneously discharging parasystolic focus.

Parasystole results from a protected, spontaneously discharging focus in the atria, atrioventricular junction, or, as in this case,

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the ventricles. This protection from the dominant rhythm, here sinus rhythm, is demonstrated by interectopic intervals that are multiples of a common denominator (1.10 seconds in this patient) and by variable coupling of the ectopic impulses with the dominant rhythm (1). Fusion beats are seen frequently, and parasystolic complexes fail to appear when their exit from the parasystolic focus is blocked by refractoriness of the surrounding tissue, here ventricular refractoriness following the first sinus-initiated complex of each cycle.

Although this electrocardiogram is too short to make a definitive determination, the first wide QRS complex of each cycle appears to have fairly constant coupling to the preceding sinus-initiated QRS: 0.41, 0.40, and 0.36 seconds for the 3 complexes seen. Even fixed coupling would not exclude parasystole in this case. Because the sinus rhythm is fixed to the parasystolic rhythm by the retrograde P waves that reset the sinus node, as long as the parasystolic rate and the sinus rate each remain constant, which is not unusual for short intervals, the parasystolic impulses will appear to be coupled to the sinus impulses (1).

Other electrocardiograms in the same patient often answer many questions. This patient's prior and subsequent electrocardiograms frequently reveal ventricular parasystole of the more typical variety with the parasystolic QRSs not fixedly coupled to the sinus rhythm because no retrograde P waves couple the sinus rhythm to the parasystolic rhythm. Furthermore, the parasystolic QRS complexes in those electrocardiograms all have the identical right-bundle-branch-block morphology seen here.

Parasystole usually is considered a rare phenomenon, but its prevalence depends on how it is sought and by whom. Routine electrocardiograms have yielded a prevalence of 0.13% (2), while the prevalence among patients, who may have >1 electrocardiogram to review, is greater (0.3%) (3). When Holter monitoring is used for the search, the prevalence is much higher (1). The parasystolic focus is more often in the ventricles (>50%) than in the atria (20%) or atrioventricular junction (20%) (2). Although most examples of parasystole have been reported in patients with heart disease, many persons with apparently normal hearts have these rhythms (1). Parasystolic rhythms per se appear to carry no significant risk.

A repetitive pattern, or group beating, of which a bigeminal rhythm is the simplest example, has many causes, which include most of the abnormalities of impulse formation and impulse conduction (4). Because parasystolic rhythms usually are independent of the dominant cardiac rhythm, they do not often present as group beating. In this example, group beating occurs not because the parasystolic rhythm is coupled to the dominant rhythm, but because sinus rhythm is coupled to the parasystolic rhythm through the mechanism of ventriculoatrial conduction resetting the sinus node.

1. Steffens TG, Gettes LS. Parasystole. In Fisch C, ed. *Complex Electrocardiography,* vol 2. Philadelphia: FA Davis, 1974:99–110.
2. Chung EK. Parasystole. *Prog Cardiovasc Dis* 1968;11:64–81.
3. Katz LM, Pick A. *Clinical Electrocardiography: The Arrhythmias*. Philadelphia: Lea & Febiger, 1956:43.
4. Glancy DL, Breaux DM. Bigeminal rhythm. *BUMC Proceedings* 2001;14:187–188.